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ABSTRACT

Nowadays, online stores are trying to differentiate themselves based on atmospherics, and there are many studies on visual and acoustic elements. However, little attention has been given to background music. On the other hand, literature of consumer behavior, psychology and education has shown that background music influences individuals' affective responses and cognitive processing. To extend background music effect to online shopping context, this paper presents an on-going project which investigates how e-store background music-induced arousal would affect online consumer search behavior. Drawing insights from social psychology theories (Yerkes-Dodson Law, Distraction-Conflict Theory, and Optimum Stimulation Level Theory), it predicts that music-induced arousal interacts with search task complexity, to influence search performance and search experience. A laboratory experiment is designed to test the research model and hypotheses. This study has the potential to enhance current knowledge about background music effect and provide e-stores owners with guidelines on incorporating new atmospheric elements.

Keywords

Background music-induced arousal, online consumer search, task complexity, search performance, search experience

INTRODUCTION

Background music is widely studied in academic and commercial settings. On one hand, it can affect consumers' mood, preference and purchase behavior; therefore it has potential benefits for in-store retailing and advertising (Garlin and Owen, 2006; Hosea, 2004; Hwang, Lee and Yu, 2007; Turley and Milliman, 2000). On the other hand, it is found to influence the performance of reading (Chou, 2007; Kallinen, 2002), writing (Ransdell and Gilroy, 2001), reasoning (Rauscher, Shaw and Kya, 1995), and dining (Caldwell and Hibbert, 2002) activities. And the effects on performance vary in different user contexts and for different tasks. In particular, investigation has been called for the impact of background music on information search task (Kallinen, 2004).

In March 2007 there were 51.3 million active websites operating on the Internet (Netcraft, 2007). E-stores are trying to differentiate themselves on the basis of atmospherics. A lot of research has been conducted on visual and acoustic elements of e-store atmosphere (e.g., colors, pictures, video or animation). However, little attention has been given to background music. To address this gap, this study aims to evaluate the effect of website background music on consumer search behavior, which is the first step in a consumer's purchase decision making process (Rowley, 2000). We focus on the arousal property of music, because it is important in regulating human consciousness, attention and emotion. Previous studies have examined the impact of specific music feature, like tempo, melody, musical pleasure, preference, or familiarity, on cognitive performance and affective responses (e.g., Chou, 2007; Eroglu, Machleit and Davis, 2005; Hahn and Hwang, 1999; Kiger, 1989; Milliman, 1986). However, little has been understood about the distinct role of music-induced arousal in influencing people's cognitive or affective processing.

Drawing insights from Yerkes-Dodson Law (Yerkes and Dodson, 1908), Distraction-Conflict Theory (Baron, 1986; Sanders, Baron and Moore, 1978), and Optimum Stimulation Level Theory (Berlyne, 1960), this study explains how music-induced arousal would interact with search task complexity to influence search performance as well as search experience.

LITERATURE REVIEW

Online Consumer Search Task

In online shopping environment, consumers looking for pre-purchase information engage in various search tasks, ranging from directed searching to general browsing (Rowley, 2000). Complexity is an important dimension when measuring the differences among various types of search tasks (Hoischer and Strube, 2000). Task complexity refers to the extent to which the searcher can deduce the required task inputs, processes, and outcomes, based on the initial task statement (Byström and Järvelin, 1995). Increasing complexity is associated with increasing uncertainty regarding these factors; consequently, more information sources might be needed (Tiamiyu, 1992), more sub-decisions should be made (Kelliher, 1990), more alternatives outcome would be obtained (Campbell, 1988), and the problem domain may be less structured (Vakkari, 1999). Therefore, compared to simple tasks, complex tasks involve processing more cues and may demand more cognitive resources, which may result in excessive cognitive load (Sweller, Merrienboer and Paas, 1998).

Studies on online information search tasks mainly focus on two dependent variables: search performance and search experience (Hong et al 2004; Kumar et al 2005). Search performance is the consequences of a search task, including efficiency (time) and effectiveness (accuracy or recall). A major determinant of search performance is search task complexity. Search experience is regarding consumers' evaluation of search process, including attitude toward or satisfaction with the searching systems (Hong et al 2004). For consumers searching for product information on a website, either search performance or search experience may influence consumers' value perception of the website, as well as the subsequent purchasing decision. Therefore, a comprehension of the factors influencing online search performance and search experience would have implications for e-store strategy and competition.

Background Music and Arousal

The dominant underlying theoretical framework for the study of background music effect derives from environmental psychology, which examines the relationship between the stimulus-organism-response (SOR). In line with this paradigm, M-R Model (Mehrabian and Russell, 1974) represents the influence of environmental cues on mediating emotional states (i.e., pleasure and arousal), which in turn result in either approach or avoidance behaviors. Pleasure refers to the degree to which a person feels good or happy with the target object, while arousal refers to the degree to which a person feels excited, stimulated or active to the target object (Russell, 2003). As a typical environmental cue, background music would change people's pleasure and arousal state, thus affecting subsequent behavior.

A significant body of work has examined how specific music features, including tempo, melody, musical pleasure, preference, or familiarity, can influence cognitive performance or affective responses (e.g., Chou, 2007; Eroglu et al, 2005; Hahn and Hwang, 1999; Kiger, 1989; Milliman, 1986). The arousal property of music, although less studied, is suggested to play a central role in its effect on human cognitive and affective processing (Caldwell and Hibbert, 2002). The reason is that a higher level of arousal is associated with higher cognitive load and increased activities (Smith and Cunow, 1966). The arousal potential of music is related to its structural composition (e.g. timbre, rhythm, and tempo). When the complexity of structure increases, information load in music increases, subsequently, music-induced arousal increases (Kallinen, 2002). In general, high arousing music can be characterized as loud, erratic, unpredictable and with a fast tempo, while low arousing music can be characterized as soft, monotonous, predictable and with a slow tempo (Berlyne, 1971). In particular, tempo has been found the closet determinant of music-induced arousal (Holbrook and Gardner, 1993). High-tempo music increases information load more than low-tempo music, as more data is presented over time (Holbrook, 1981).

This study focuses on background music of a website and the arousal induced by the music. In order to evaluate its potential influence on search performance and search experience, relevant theories and empirical studies will be introduced in the following sections.

Impact of Arousal on Cognitive Performance: Yerkes-Dodson Law and Distraction-Conflict Theory

Yerkes-Dodson Law and Distraction-Conflict Theory provide theoretical foundation for the impact of arousal on cognitive performance. Yerkes-Dodson Law (Yerkes and Dodson, 1908) posits an inverted U-shaped relationship between arousal and performance. It essentially argues that there is an optimal level of arousal for the performance of a particular task, and

performance suffers when the arousal level is either too high or too low. Furthermore, the optimal level of arousal is dependent on the nature of task (Yerkes and Dodson, 1908). For example, difficult or intellectually demanding tasks may require a lower level of arousal for optimal performance (to facilitate concentration). Simple tasks with low cognitive demanding or require persistence may be performed best with higher levels of arousal (to increase motivation). The interpretation is that the increase of arousal reduces an individual's attentional control, accuracy, short-term memory, and retrieval efficiency (Easterbrook, 1959; Eysenck 1984). And the different effects of arousal on simple and complex tasks may be due to the number of cues that must be processed and the complexity of processes.

Focusing on the arousal caused by distractions (e.g. industrial noise, background music), Distraction-Conflict Theory (Baron, 1986; Sanders et al., 1978) suggests that distractions facilitate performance of simple tasks and inhibit performance of complex tasks. It has been utilized to explore the effect of distractions or interruptions on the performance of primary task. For example, Speier, Vessey and Valacich (2003) assess the effects of interruptions, task complexity and information presentation on computer-supported decision-making performance. In their study on distractions in a wireless mobile environment, Nicholson, Nicholson, Parboteeah and Valacich (2005) propose that the increased arousal state, created by both the presence of distractions and the complexity of the task, affects the individual's decision making outcome. However, the two theories have seldom been applied to understand background music effect.

Impact of Arousal on Affective Responses: Optimum Stimulation Level Theory

Arousal induced by background music may also impact behavior via its influence on affect (Caldwell and Hibbert, 2002). According to Optimum Stimulation Level Theory (Berlyne, 1960), the relationship between arousal (or stimulation), which is obtained from the environment or through internal means, and a person's affective reaction to the arousal, follows an inverted U-shaped function. The intermediate level of stimulation is perceived as most satisfying. Deviation from the optimum level will lead to attempts to reduce or augment stimulation back to the optimum level.

There is empirical evidence in consumer behavior literature that people prefer music with moderately arousing structural elements (Holbrook and Anand, 1990; North and Hargreaves, 1996a, 1996b). For example, by manipulating music tempo over broad range, Holbrook and Anand (1990) find that moderate tempo induces more positive affective responses. Findings of prior studies also suggest that the effect of music-induced arousal on consumption experience is dependent on consumers' desire of stimulation in certain consumption context. For example, faster music may have a positive relationship with customer satisfaction within a restaurant (Areni and Kim, 1993). However, fast music caused less positive affective responses to waiting time in a registration line than slow music (Oakes 2003). Furthermore, Caldwell and Hibbert (2002) suggest that fast and loud music may be regarded favorably in a dance club or a bar, but slower and softer music may be preferable in a health spa. Nevertheless, these understandings are largely based on empirical findings from traditional consumption contexts, and knowledge of the role of musical arousal in online shopping environment is yet to be explored.

RESEARCH MODEL AND HYPOTHESES

According to the above discussion, background music of a website would change visitors' arousal state and thus will affect their performance and experience of online search activities. The effect of music-induced arousal would be moderated by search task complexity. The research model is presented in Figure 1. The hypotheses will be discussed in the following sections.

Search Performance

Time and accuracy are commonly-used performance indicators for cognitive tasks (e.g., Kallinen, 2002; Mayfield and Moss, 1989). In this study, search time is defined as the length of the entire search process, starting from initiating a search task to finding the needed results. Search accuracy refers to the degree that a search task results in precise information. It is more relevant to search tasks with specific targets (Hong, Thong and Tam, 2004), which is the focus of our study.

The relationship between background music-induced arousal and search task performance can be depicted in Figure 2. The curves illustrate the moderating role of task complexity. For simple search tasks, performance increases with the increase of arousal, and the best performance occurs at a high level of arousal. The reason is that when performing simple tasks, one is likely to have excess cognitive capability, so the background music-induced arousal would exert an energizing effect (Yerkes and Dodson, 1908) by helping concentration on the relatively few information cues of the task. As a result, search time will reduce and search accuracy will increase (area A in Figure 2), until the arousal arrives at a higher level where the individual's stimulation is brought closest to an optimal level (area B in Figure 2). This is consistent with previous findings that fast music, compared with slow music or silence, helped to achieve the best performance of collecting and calculating stock price (Mayfield and Moss, 1989) and reading news on a pocket computer (Kallinen, 2002).

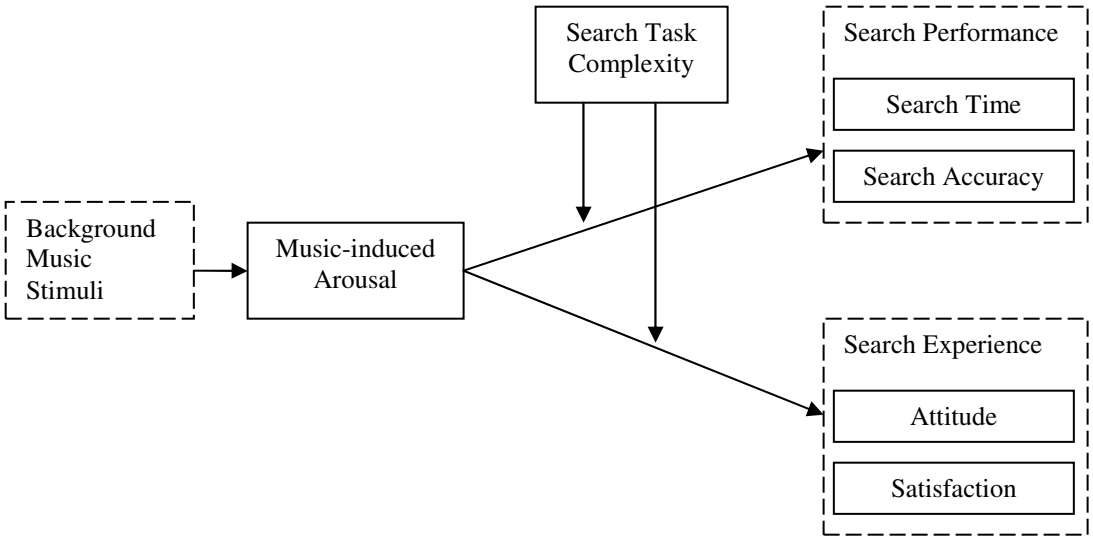

Figure 1. Research Model

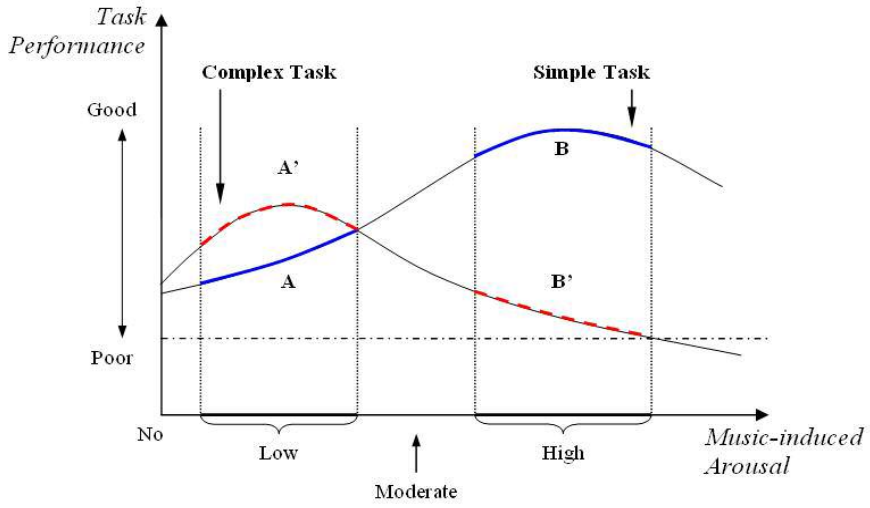

Figure 2. Arousal and Search Task Performance

On the contrary, for complex search tasks, performance is likely to decrease with the increase of arousal, although it might slightly increase when the arousal is low. That's because when performing a complex search task, one may have little excess cognitive capacity. Hence, although a bit of distraction may slightly increase the performance by increasing motivation in seeking required information (area A' in Figure 2), much distraction is likely to cause the loss of task-relevant information cues, and severe distractions may even encourage the use of heuristics, shortcuts, or satisficing decision process, resulting in lower decision accuracy (Baron, 1986). Consequently, when music-induced arousal is high, search time will increase and search accuracy will reduce (area B' in Figure 2). Prior studies have found that fast music inhibited reading compared with slow music (Holbrook, 1981), and reading comprehension was performed better with low-arousal music than high-arousal music or in silence (Kiger, 1989). Although it seems difficult to compare the performance between low music-arousal and no music condition, the detrimental effect of high music-arousal has been confirmed. Hence, we have the following hypotheses:

H1a: *When the search task is simple, high music-induced arousal leads to shorter search time/higher search accuracy compared with low music-induced arousal or no music condition.*

H1b: *When the search task is complex, high music-induced arousal leads to longer search time/lower search accuracy compared with low music-induced arousal or no music condition.*

Search Experience

Search experience is reflected by two variables: attitude and satisfaction. Attitude is the consumer's evaluation summary of using the website for information search. Satisfaction is the consumer's evaluative judgment of the overall search experience (Bhattacherjee, 2001).

Based on Optimum Stimulation Level Theory, the impact of background music-induced arousal on individual's search experience might depend on his/her desired stimulation when carrying out a particular search task. Therefore, we expect that search task complexity also moderates the relationship between music-induced arousal and search experience. When performing a simple search task, the individual might be far from his/her optimal stimulation level and seek for arousal either through internal means or from the environment (Berlyne, 1960). Hence, music which induces high arousal (e.g., fast music) is likely to bring the individual closest to the preferred stimulation level, and evoke more positive emotional responses (e.g., exciting, alert), consequently, the individual would have more preferable attitude and feel more satisfied with the search process, compared with no music or low music arousal conditions. Evidence is found in prior research that fast music is positively related to customer satisfaction in restaurant or bar (Areni and Kim, 1993). In contrast, when performing a complex search task, the individual is unlikely to desire or seek additional stimulation, because he/she might have been around the optimal arousal level, due to the high cognitive load caused by the search activity (Baron, 1986). In this case, the presence of low-arousal background music (i.e., gentle music) can either bring the individual closer to, or take the individual slightly away from the desired stimulation level, which may not be strong enough to negatively affect the emotions. However, a high level of music-induced arousal is very likely to take the individual far away from the optimum stimulation level, which may evoke negative emotions (e.g., stress, irritating) and negatively influence the individual's attitude towards and satisfaction with the search process. Therefore, we hypothesize:

H2a: *When the search task is simple, high music-induced arousal leads to more positive attitude towards/higher satisfaction with the search process compared with low music-induced arousal or no music condition.*

H2b: *When the search task is complex, high music-induced arousal leads to less positive attitude towards/lower satisfaction with the search process compared with low music-induced arousal or no music condition.*

RESEARCH METHOD

A 3×2 laboratory experiment is designed. There are two between-subject factors: music-induced arousal at three levels (no, low, and high), and search task complexity at two levels (low and high). Each subject would perform three search tasks of the same complexity with no time limitation. Task order is counterbalanced within treatment. A total of 144 undergraduate students would be recruited. To encourage the subjects to perform quickly and accurately, cash incentive would be awarded to the highest-performing subject in each treatment.

Search Task

A search task involves searching for information about a desired product, with task requirement described as a life scenario. Three products of different categories (i.e., MP3 Players, Coffee/Espresso Makers, and Wine) are chosen. Task complexity is manipulated by varying the specificity of requirements. For low complexity task, specific requirements about the product attributes are clearly stated, while for high complexity task, the requirements are less clearly stated. A manipulation check asks the participants to rate the overall complexity of the task after each search (see Bell and Ruthven, 2004). An e-store with clean design and rich information is chosen as the experimental website.

Music-induced Arousal

In line with prior research, music-induced arousal is manipulated by fast-tempo (108-208 BPM) or slow-tempo (40-76 BPM) classic music (without lyrics), controlling the parameters of rhythm, harmony, mode, pitch, and volume (Dubé, Chebat and Morin, 1995; Eroglu et al., 2005). Classic music has been preferred to other music genre (e.g., popular music) so as to eliminate confounding factors, such as season effect (see Alpert, Alpertb and Maltzc, 2005; Chebata, Chebatb and Vaillant, 2001; Dubé and Morin, 2001). Following this approach, two classic musical pieces are selected from Dubé et al. (1995): (1) Prélude à l'après-midi d'un faune, first movement by Debussy; (2) the Divertimento in D major K.314, third movement by Mozart. They are chosen because they have been validated as similar in pleasure level (moderate), but different in arousal level (low vs. high). To simulate background music of an e-store, the two music extracts will be added to the experiment instruction page, and will play continuously when the subjects perform search tasks. A manipulation check asks the subjects to indicate the degree of both arousal and pleasure, using the Self-Assessment Manikin (SAM) (Bradley and Lang, 1994) (shown in Figure 3). A successful check should demonstrate similar pleasure score and different arousal scores.

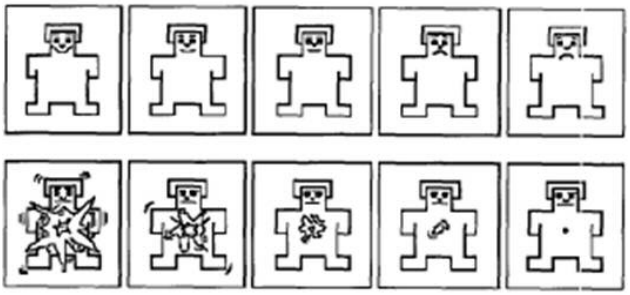

Figure 3. The Pleasure (top) and Arousal (bottom) Scales of the Self-Assessment Manikin Self (Bradley and Lang 1994)

Dependent Variables

Search time is measured in seconds by the individual search task duration for each product. Search accuracy is calculated as the number of product features found by a subject, which match the task requirement. Perceptions of search experience are measured by validated items adapted from prior studies (e.g., Ajzen and Fishbein, 1980; Bhattacherjee, 2001). Attitude is measured by 3 items with 7-point semantic differential scales (a bad idea/a good idea, unfavorable/favorable, negative/positive). Satisfaction is measured by 4 items (dissatisfied/satisfied, displeased/pleased, frustrated/contented, terrible/delighted).

Control Variables

Music-induced pleasure, music listening habit, music preference, personality traits and search expertise, which may influence music effect or search performance (Etaugh and Ptasnik, 1982; Furnham and Allass, 1999; Nantais and Schellenberg, 1999), are included as control variables. They will be measured with validated items adapted from previous studies.

Experimental Procedure

The experiment procedure, which includes six steps, is briefly described in Figure 4. Subjects are asked to complete three separate search tasks and wear the headphone during the entire session. The experiment will last around 45 minutes.

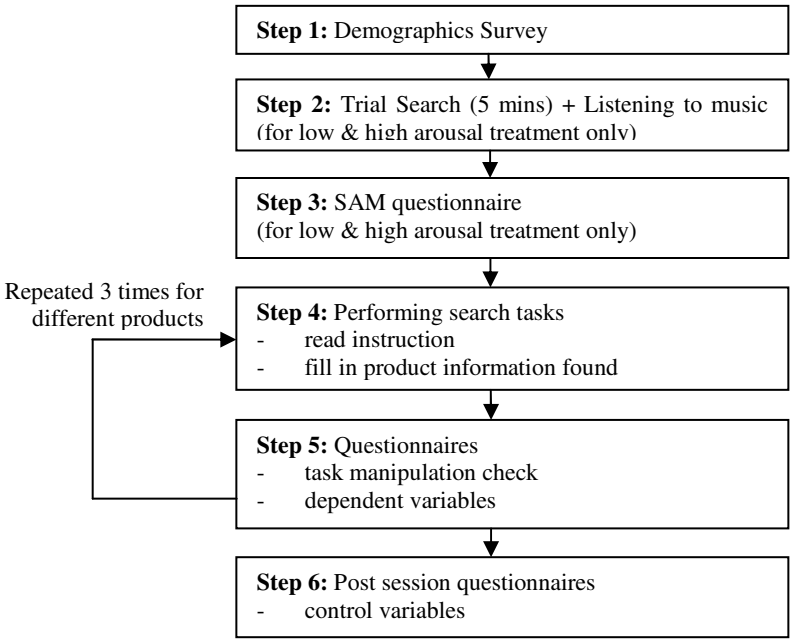

Figure 4. Experiment Procedure

DISCUSSION

This study has potential contribution to both research and practice. From research perspective, this study extends our knowledge of background music effect to a new environment (online shopping context) and a new task category (consumer search task). As the Internet presents a fundamentally different environment for retailing than traditional physical stores or catalogs (Hoffman and Novak, 1996), marketing activities such as employing background music as atmospheric cue, need to be re-evaluated. Secondly, findings of this study will enhance our understanding of the role of music-induced arousal in cognitive processing and affective responses. While current literature on background music effect is largely based on empirical findings, this study provides a solid theoretical foundation by integrating several theories in social psychology. Furthermore, this study hopes to encourage future research on the role of background music in online shopping context. For example, studies can be conducted on the interactive effect of music-induced arousal and pleasure, or the influence of consumer heterogeneity on background music effect. From practical perspective, this study can provide guidelines for e-stores owners and designers on how to incorporate new atmospheric elements to enhance consumer value. Results from our study can make suggestions on whether to embed background music, and how to embed suitable music in their online stores.

We acknowledge the limitations of our study. Firstly, our control of other musical elements, such as music-induced pleasure and music preference may not be the real life situations. However, it has the advantage to focus on the distinct role of music-induced arousal, which has seldom been examined. Secondly, individual factors, such as search experience and product knowledge, may affect an individual's desired arousal and assessment of task complexity. The experiment design reduces such influences by random assignment and by including several product categories for search tasks.

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